Republic of Lebanon
Telecommunications
Regulatory Authority

P U B L I C C O N S U L T A T I O N D O C U M E N T

Spectrum Refarming:

Broadband Context and Framework

A Consultation Document for Stakeholder Review

A comprehensive framework to reorganize Lebanon's radio frequency spectrum, accelerate broadband deployment through Fixed Wireless Access (FWA), regularize the unlicensed market, and establish a future-ready 5G/6G licensing regime.

CONSULTATION PERIOD: **3 Weeks from Publication** - TARGET BANDS: **2.3 · 2.6 · 3.5 · 26 GHz**

ISSUED PURSUANT TO LAW NO. 431/2002

REPUBLIC OF LEBANON

Responses via spectrum_refarming@tra.gov.lb or registered mail

Spectrum Refarming:

Broadband Context and Framework

1 Executive Summary

1.1 What Is This Document About?

This consultation document proposes a spectrum refarming and licensing framework focusing primarily on Fixed Wireless Access (FWA) services to accelerate broadband availability across Lebanon while regularizing existing spectrum use. It sets out options and illustrative mechanisms for stakeholder discussion. Detailed clauses and templates are illustrative and will not be treated as final regulatory decisions. TRA invites evidence-based responses to inform any subsequent regulatory decisions.

1.2 Why Is This Needed Now?

Lebanon's wireless broadband market faces a critical structural problem. While the country has approximately 12 licensed providers including mobile and fixed operators, the market is dominated by an estimated 3,000 unlicensed operators ("resellers") and Collectors serving roughly 800,000[1] subscribers — approximately 64% of Lebanese households. Meanwhile, the 9 licensed Data Service Providers (DSPs) serve only about 34,000 subscribers. Although total broadband penetration is virtually 100%, the majority of this service is provided through unregulated spectrum. Furthermore, DSPs have used spectrum beyond assigned bands, focused on P2P enterprise links rather than PMP/FWA access. All this results in inefficient use of a scarce national resource, poor service quality for consumers, lost government revenue, and an inability to deploy modern 4G/5G technologies. The refarming plan is designed to bridge this gap by transitioning all customers into a legal, quality-assured framework managed by licensed national and/or regional service providers.

Crucially, this refarming initiative is driven by the TRA's recent technical audit, which identified widespread irregularities and inefficiencies in the current spectrum landscape that have been going on for a long time. Findings indicate that a significant number of **Data Service Providers** (DSPs) are currently operating within frequency bands with and without formal assignments or are using their licensed Point-to-Multipoint (PMP) spectrum merely as Point-to-Point (P2P) or/and are using other unauthorized spectrum to serve their own customers. These systemic compliance gaps and the resulting fragmented and inefficient spectrum usage underscore the urgent need for this comprehensive refarming and regularization framework, which is essential to restore regulatory integrity and ensure the efficient allocation of Lebanon's scarce national resources.

This plan specifically targets the refarming of IMT Mid-bands (2300 – 2400 MHz, 2500 – 2700 MHz, and 3300 - 3800 MHz) to address market needs for Fixed Wireless Access (FWA) and to

[1] This figure is based on TRA estimates; stakeholders are invited to provide updated data

ensure fair competition. Upon conclusion of the refarming plan, DSPs currently operating P2P links outside the IMT bands to serve their end-users will likely be mandated to migrate those links into assigned IMT bands as per the refarming awards; P2P links used for backhauling and for their own backbone will be revisited and reallocated in accordance to TRA Spectrum Licensing Regulations to ensure efficient and optimal use of spectrum. This migration, however, could be addressed in a separate refarming exercise to ensure orderly transition and service continuity.

Extended C-Band (3.8–4.2 GHz). International benchmarks show that while the 3.3–3.8 GHz range is widely harmonized for IMT, the upper C-Band (3.8–4.2 GHz) is only partially adopted. In Europe, it is primarily licensed for local/private 5G networks, while in the MENA region, Saudi Arabia has assigned 3.8–4.0 GHz nationally to mobile operators. Lebanon will therefore treat 3.8–4.2 GHz as a future option, subject to device ecosystem readiness, coexistence studies with satellite services, and regional harmonization outcomes. Stakeholders are invited to provide evidence on the feasibility, timing, and market demand for extending IMT awards into this band.

TRA's assessment is a preliminary view based on current data. This consultation seeks stakeholder evidence to confirm or challenge this assessment and to inform any final determination on market configuration. The TRA proposes three long term policy pathways to support strategic planning and ensure the efficient, sustainable, and future ready use of the radio frequency spectrum (Options 1, 2, 3 with variants) in addition to three baseline national operators MIC1, MIC2, together with MoT/Ogero at present, transitioning to Liban Telecom (LT) in the future. and differing approaches to FWA rollout:

- Option 1: Baseline 3 telecom operators + 1 new national FWA (4G/5G) + 1 regional FWA (with 4G FWA constraint due to a spectrum cap of 50 MHz).
- Option 2: Baseline 3 operators + 2 new national FWA (4G/5G).
- Option 3A: Baseline 3 operators + 9 DSPs elevated to national FWA with 30 MHz each (with 4G FWA constraint).
- Option 3B: Baseline 3 operators + 9 DSPs elevated to national FWA with 40 MHz each (with 4G FWA constraint).
- Option 3C: Baseline 3 operators + a certain number of national FWA (4G/5G, depending on acquired spectrum) DSPs. The number of DSPs as well as their spectrum will be determined based on the results of the auction of available spectrum.

Needless to say, the 30-40 MHz restriction in Options 3A and 3B is directly related to the large number of DSPs (9) and scarcity of available spectrum. Furthermore, the 4G technology

restriction is a direct consequence of the limited acquired spectrum being below the threshold needed for graceful 5G national network rollout.

Baseline operators will transition their re-farmed holdings into licensed 5G spectrum under TRA oversight, ensuring continuity of national coverage. This measure is aligned with Government policy but may be balanced by enforceable spectrum caps and auction opportunities for DSPs and new entrants to secure 5G capacity. While baseline operator allocations are guided by existing government policy, stakeholders are invited to comment on the broader implications and associated safeguards. However, the refarming rules covered later in this document may include provisions relevant to the baseline operators.

The consultation sets out:

(1) Refarming rules and spectrum bands available for each option,
(2) Enforceable coverage rollout and reseller customer absorption obligations,
(3) Auction and pricing rules (AIP/auction hybrid), and
(4) A phased implementation and enforcement plan.

1.3 Strategic Objectives and Expected Outcomes

The proposed framework is designed to move the sector from a period of regulatory dormancy toward a modernized broadband landscape. By implementing these measures, the TRA aims to:

- **Restore Regulatory Order:** Address the current disorder in spectrum usage by revising allocations and refarming valuable IMT bands to their highest-value use.
- **Regularize the Market:** Establish a robust regulatory framework that transitions the illegal broadband market into a formal, licensed ecosystem.
- **Guarantee Stability:** Ensure absolute continuity of services for existing consumers during the refarming transition and the transformation of the reseller market.
- **Bridge the Digital Divide:** Expand both fixed and mobile broadband penetration across all regions, ensuring that rural areas receive the same infrastructure priority as urban centers.
- **Incentivize Growth:** Promote healthy competition and large-scale infrastructure investment by restructuring the sector to create clear, long-term licensing regime and investment opportunities for both existing players and new entrants. To this end, Broadband providers are strongly encouraged by the TRA to consider applying for and get dully engaged in fixed access licenses (FTTH, FTTC, etc.) besides FWA licenses.
- **Service Neutrality.** As IMT bands support both mobile and FWA services and are not allocated exclusively to a single use case, differentiation is typically applied through

licensing conditions rather than separate allocations. This approach is expected to shape market development by influencing deployment choices, competitive dynamics, and investment strategies across mobile and fixed broadband services.

1.4 Key Outcomes for Citizens

- Faster internet speeds: typically 10-50 Mbps guaranteed for 90% of the time, compared to often unreliable speeds today.
- Better coverage: Licensed operators are expected to meet coverage obligations that balance remote area access and investment incentives. TRA is considering mechanisms to coordinate with FTTH rollout (for example, coverage for rural and not just suburban areas).
- Consumer protection: All 800,000 subscribers currently served by unlicensed operators will be migrated to legal, regulated services with enforceable quality standards.
- Lower prices: Increased competition among licensed operators is expected to drive prices down.
- Future-ready infrastructure: The plan reserves spectrum capacity for 5G and future 6G technologies.

1.5 Measurable Performance Targets

Strategic Objective	Target	Timeline
Restore Regulatory Order	100% of DSPs operating within assigned bands; zero unauthorized spectrum use	End of Phase 4 (Q2 2027)
Regularize the Market	All ~3,000 unlicensed resellers either absorbed or ceased operations	End of Phase 5 (Q4 2027)
Broadband Penetration	Licensed broadband penetration: 60% of households	2028
Average Broadband Speed	National average data speed: 50 Mbps	2029
Rural Coverage	75% rural population coverage by licensed FWA/FTTH	Year 5 of license
Digital Divide	Max 15% gap between urban and rural broadband penetration	2029

Strategic Objective	Target	Timeline
Service Quality	30 Mbps for 90% of time; latency below 50ms	Year 5 of license

Annex B contains a mention of regulations and legal Instruments relevant to the spectrum refarming plan.

This consultation contributes to Lebanon's national vision of becoming a regional digital hub, by restoring regulatory credibility, ensuring predictable licensing, and fostering competitive broadband markets.

This document is a consultation paper. Where the draft presents detailed mechanisms, illustrative legal text, or operational templates, these are provided for discussion only and do not represent final regulatory decisions. The annexes contain illustrative options, draft clauses and technical details intended to inform stakeholder responses. They are not proposed final instruments; TRA will consider responses before drafting any binding measures.

2 Purpose, Scope and Legal Basis

2.1 Purpose

Refarm and repackage spectrum to enable the rapid, efficient deployment of FWA (4G and 5G) services, regularize unlicensed reseller activity, and maximize the socioeconomic benefits of scarce spectrum resources.

The TRA defines spectrum refarming as the deliberate process of modifying or releasing assigned frequency bands and inappropriate/inefficient use of spectrum in accordance with international standards and best practices to ensure that spectrum is allocated to services and applications of higher socioeconomic value. This plan specifically targets IMT bands to address market needs and ensure fair competition. Key regulatory pillars of this exercise include the establishment of rules for optimal usage —such as Spectrum Caps S_{max}, Minimum Spectrum requirements S_{min}, and Reserved Spectrum for new entrants —while accounting for migration transition times and service continuity.

This consultation proposes a spectrum refarming process (the reallocation and technical re-planning of frequency bands) and a separate licensing framework and options (Spectrum Pricing (auctions, Administrative Incentive Pricing, RTU fees, and license terms) to enable Fixed

Wireless Access (FWA) deployment, accelerate broadband availability across Lebanon, and regularize efficient spectrum use.

2.2 Scope

Applies to all national and regional licensees and existing Data Service Providers (DSP-1 … DSP-9). The consultation focuses on FWA (fixed wireless broadband) across mid and high bands (notably 2100/2300/2500/3300–3800 MHz; and 26 GHz).

The Ministry of Telecommunications and the Council of Ministers are currently fully engaged in FTTH expansion projects within the MoT's fixed network. The TRA's licensing mandate covers fixed network FTTH rollout. The TRA will issue fixed individual licenses for FTTH deployment and coordinate their rollout with FWA coverage obligations.

The refarming plan, together with the enforcement, migration, coverage and rollout obligations and temporary authorization measures described in Sections 10–13, contributes greatly to the TRA's operational pathway to regularize unlicensed users by providing legal migration routes, reseller absorption obligations, and penalties for non-compliance.

2.3 Legal Basis

This consultation is issued pursuant to Law No. 431 of 2002 and the decisions of the Council of Ministers, which confer upon the Telecommunications Regulatory Authority the responsibility for spectrum assignment and management, licensing, and regulatory oversight. TRA's mandate includes allocation and assignment of radio frequencies, licensing of operators, setting and collection of spectrum fees, and monitoring and enforcement of compliance.

In particular, this consultation is grounded in the following provisions of Law 431/2002:

- **Article 15:** Grants the TRA authority to manage, allocate, assign, and reassign radio frequency spectrum.
- **Article 16:** Empowers the TRA to establish spectrum licensing terms and conditions, including technical parameters and fee structures.
- **Articles 11b, 11c, and 17 :** Authorizes the TRA to set and collect spectrum usage fees and administrative charges.
- **Article 5 (3):** Establishes the TRA's obligation to conduct public consultations on matters of regulatory significance.
- **Article 48:** Provides for transitional provisions including temporary license extensions.

These provisions collectively establish TRA's unambiguous jurisdiction to conduct this spectrum refarming exercise, including the reassignment of frequencies currently held by DSPs, the introduction of new licensing categories, and the establishment of spectrum pricing frameworks.

The TRA will adhere to the general policy set by the Council of Ministers and will coordinate with the Ministry of Telecommunications. Where the MoT has issued draft policy documents, the TRA will treat them as inputs while ensuring final refarming decisions conform to CoM policy and Law 431/2002.

3 Market Context and Rationale

3.1 Market Analysis

- To resolve the current fragmentation and inefficiencies in spectrum usage, the TRA is implementing an integrated broadband acceleration strategy. This involves substantial investment in FTTH through MoT/Ogero (Liban Telecom once established) and the licensing of new national and regional operators to provide high-speed FWA services and FTTH rollout. By allowing both existing DSPs and/or new entrants to apply for these licenses, the TRA aims to trigger significant infrastructure deployment. This competitive landscape is intended not only to improve service quality and reduce prices but also to provide a clear regulatory path to resolve the proliferation of unlawful operations and unlicensed resellers.

- **Institutional reset:** During 2012–2025, responsibility for licensing actions and spectrum assignments was exercised by the Ministry of Telecommunications. This consultation clarifies the TRA's role going forward and aligns refarming actions with the statutory responsibilities set out in Law 431/2002. The market currently comprises **9 DSPs** (operating across licensed and unlicensed bands), in addition to two established mobile operators (MIC1, MIC2), and MoT/Ogero (Liban Telecom once established) as the statutory national operator.

- **Problem statement:** Current market data highlights a critical imbalance: while there are 12 licensed providers, they are dwarfed by thousands of illegal operators. The unlicensed internet market is nearly double the size of the licensed market, with unlicensed resellers serving approximately 800,000 subscribers (~64% of households) compared to just 34,000 for licensed DSPs. Although total broadband penetration is virtually 100%, the majority of this service is provided through unregulated channels. This refarming plan is designed to bridge this gap by transitioning these customers into a legal, quality-assured framework

managed by licensed national and/or regional service providers. DSPs have used spectrum beyond assigned bands, focused on P2P enterprise links rather than PMP/FWA access, and an estimated **~3,000 unlicensed resellers** serve a large portion of households[2]. The refarming exercise aims to:

a) rationalize spectrum use;
b) create enforceable rollout obligations for FWA;
c) resolve illegal operations and regularize reseller customers; and
d) allocate spectrum to support 4G/5G FWA and future 6G expansion slots.

3.2 "Market Sustainability Analysis":

- **Market sizing:** Lebanon has approximately 1.26 million households (based on 5.86 million population / ~4.65 persons per household). With total broadband penetration near 100%, the addressable FWA market is approximately 700,000–900,000 households (excluding those who will migrate to FTTH).
- **Minimum viable scale:** Based on international benchmarks, a national FWA operator requires a minimum of 80,000–120,000 subscribers to cover fixed costs (spectrum fees, backbone, NOC, billing). This implies a maximum of 6–8 viable operators at full market penetration, but realistically 4–5 given FTTH competition from MoT/Ogero (LT once established.)
- **ARPU analysis:** At an estimated FWA ARPU of $15–25/month, a 100,000-subscriber operator generates $18M–$30M annual revenue, sufficient to sustain infrastructure investment at a 30–40% EBITDA margin.
- **Conclusion:** "TRA's assessment that the market can sustain a maximum of 5 wireless broadband operators nationally is based on the above analysis and is consistent with operator counts in comparable markets (Jordan: 3 MNOs + 1 FWA; Egypt: 4 MNOs; Qatar: 2 MNOs)."

[2] Estimates are based on TRA's accumulated data and verified by its own means. Stakeholders may provide updated subscriber counts and reseller estimates during the consultation period.

4 FWA Technology Evolution

4.1 Legacy systems

Fixed Wireless Access in Lebanon globally began with narrowband and early broadband wireless systems, often based on proprietary point-to-multipoint (PMP) technologies in the 1990s and early 2000s. These systems provided limited throughput, were spectrum-inefficient, and primarily served enterprise or niche residential markets. DSPs in Lebanon still operate legacy PMP or P2P links, which lack scalability and consumer-grade service quality.

4.2 Transition to 4G FWA

The introduction of LTE enabled a step-change in FWA performance. LTE-based FWA systems offered standardized equipment, higher spectral efficiency (~2.5 bits/Hz), and the ability to deliver effective throughput of 10–50 Mbps per household. In Lebanon, DSPs elevated under Option 3A/3B are constrained to 4G FWA due to their smaller spectrum bandwidth allocations, but LTE remains a viable technology for rapid suburban and rural broadband rollout using midbands and serve urban areas with high band allocation.

4.3 5G FWA

With 5G, FWA has become a mainstream broadband solution. 5G FWA systems leverage midband (2.3 – 2.4, 2.4 – 2.6,3.3–3.8 GHz) and high-band (26 GHz) spectrum to deliver fiber-like speeds, often exceeding 100 Mbps per household. Spectral efficiency improves to ~4.5 bits/Hz, and advanced MIMO/beamforming techniques enable dense urban coverage. In Lebanon, baseline operators and national DSPs are expected to deploy 4G/5G FWA in midband and high-band allocations, supporting national coverage obligations.

4.4 Preparations for 6G

International roadmaps anticipate 6G deployment in the early 2030s, with experimental use of sub-THz bands (100–300 GHz) and integration of satellite/terrestrial hybrid FWA. Lebanon's refarming exercise reserves spectrum capacity for future expansion, ensuring that current allocations do not preclude 6G readiness. Preparatory steps include:

- Reserving sub-bands and expansion slots in midband allocations.
- Studying possibilities to open new bands in-line with international direction.

- Development of access and infrastructure licensing framework to maintain competition and cater for 5G/6G capacity.
- Ensuring technology-neutral licensing to accommodate 6G standards.
- Aligning rollout obligations with ITU and 3GPP timelines for next-generation FWA.

4.5 Policy implication

The evolution from legacy PMP to LTE, then to 5G, and preparations for 6G underscore the need for flexible, forward-looking spectrum policy. The consultation's options (1, 2, 3A, 3B) are designed to balance immediate 4G FWA deployment with pathways to 5G expansion, while reserving capacity for 6G innovation.

5 Legal and Regulatory Background of Data Service Provider (DSP) Licenses in Lebanon

The regulatory framework governing Data Service Providers (DSPs) in Lebanon has evolved through a series of decrees and ministerial decisions. Historical licenses were issued with varying terms; some were time limited and later renewed by decree, granting these companies rights to establish and operate data transmission networks, as well as access to telecommunications infrastructure and spectrum resources. For clarity, the consultation summarizes the key decrees, the current legal status of those authorizations, and notes where license durations have been set to one year with annual renewal provisions.

5.1 Early DSP Licensing Framework

Certain companies, including **DataSat, Cable One, Pesco, and Cedarcom**, were granted **exceptional licenses prior to 2000** allowing them to establish wireless data transmission networks for an initial period of five years with 20% revenue share, renewable annually by decision of the Minister of Telecommunications. These licenses permitted international connectivity through **VSAT satellite stations**, subject to Ministry approval.

The decrees also stipulated that license renewal could be withheld if the Ministry of Telecommunications establishes its own network capable of providing equivalent services.

Furthermore, the State bears **no financial responsibility or liability** related to the establishment or operation of these private networks.

5.2 Licenses Issued in 2000

A second group of DSPs, including **Digital Connection, Trisat, Waves, Sodetel, and LCNC**, received exceptional licenses in 2000 authorizing them to establish **data transmission networks without a fixed duration with revenue share 40%**.

These companies were not allocated frequencies at the time, despite a State Council decision granting them the right to obtain frequencies. In 2010, the TRA implemented the State Council decision and granted Trisat, Waves, and LCNC the frequencies that allowed them to commence operations. After 2015, the MoT made changes on the TRA assignments and license terms and conditions; reallocated spectrum to some of them and reactivated certain DSPs and assigned new spectrum to some other DSPs.

In certain cases, such as **Waves**, the license explicitly authorized implementation of Wi-Max Advanced services and the transmission of all forms of digital information, including data, images, and video services.

In 2022, the MoT renewed all DSPs' licenses by Decree 9472 and activated Digital Connection's license, but the State Council issued a preliminary decision to suspend its implementation.

These licenses granted several rights, including:

- Local interconnection and right of way over the MOT's network
- International interconnection through the MOT's network

Direct satellite connectivity through **VSAT stations**The right to build **radio networks** to connect subscribers

The decrees also maintained the principle that the State bears **no financial obligations** associated with the companies' infrastructure or operations.

5.3 Infrastructure Access Rights

Subsequent decrees expanded the rights of DSP operators by granting:

- **Access to the copper network through local loop unbundling** under Decree No. 17090/2006
- **Rights to deploy fiber-optic networks**, including interconnection and rights of way over infrastructure belonging to the MoT, under Decree No. 3260/2018

Despite these provisions, the implementation of some of these rights remained limited or incomplete.

5.4 Spectrum Use

Spectrum allocation for DSP operators has historically been determined by the **MoT in coordination with the operators**, within the framework of the national frequency allocation plan. Frequency bands were assigned through ministerial decisions, decisions of the Director General of Exploitation and Maintenance, or technical meeting records.

In practice, several operators expanded their use of frequency bands beyond those formally allocated, including usage in bands for which **no explicit approval had been granted by the MoT**.

Migration from the 3.5 GHz Band

Following the decision of the International Telecommunication Union (ITU) to identify the **3.5 GHz band for International Mobile Telecommunications (IMT)**, the Ministry of Telecommunications initiated measures to reorganize the use of this band in Lebanon. In this context, the **General Directorate for Exploitation and Maintenance** at the MoT formally requested that all Data Service Providers (DSPs) cease using the 3.5 GHz band and migrate their operations to alternative assigned frequencies. This request was communicated through the **Letter No. 1982/E&M dated 10 August 2022**, which granted operators a **one-year transition period** to vacate the band.

5.5 Recent Licensing Renewal and Fee Structure

Decree No. **9472/2022** renewed all DSP licenses issued under previous decrees for **one year**, including Sodetel and Digital Connections, with the possibility of **annual renewal by decision of the Minister of Telecommunications**. The decree also harmonized the terms and conditions of the DSP licenses.

Under this framework, DSPs are subject to the following financial obligations:

- **Revenue share:** 25% of total invoiced revenues to subscribers.
- **Spectrum fee:** A fixed fee of **LBP 500 million** for the use of allocated frequency bands.
- **Additional fee:** An extra **LBP 500 million** for the provision of digitized services such as image or video transmission.
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5.6 Actual DSP Spectrum Usage

Based on data provided by the DSPs, the TRA found that most DSP customers are corporate rather than residential, and that the frequency bands allocated to DSPs for broadband services (2.3, 2.5, 3.5 and 26 GHz) are not being used by the majority of DSPs to deliver broadband to end-users. Some DSPs do not use these bands at all and instead provide services via microwave links in other frequency ranges. And since the MoT had previously issued the Decision No. 1982/E&M (10 August 2022) requiring DSPs to vacate the 3.5 GHz band since it was identified for IMT/5G use, the immediate impact of reallocating these bands for new advanced services is expected to be limited.

6 Consultation Principles and Process

- **Transparency & inclusiveness**
    - In parallel to publishing this consultation, the TRA plans to hold workshops with MIC1, MIC2, MoT/Ogero, DSPs, resellers, consumer groups, and civil society, and accept written responses during the consultation period.
- **Policy Principles**

  The TRA's broadband framework is guided by ten strategic pillars: (1) transitioning to a long-term licensing regime; (2) ensuring service continuity; (3) establishing a fair, future-proof allocation framework; (4) implementing transparent, market-based pricing models; (5) promoting infrastructure investment; (6) narrowing the rural-urban digital divide; (7) Implementing CoM decisions and supporting market players without undermining fair competition; (8) enhancing customer experience; (9) aligning spectrum policy with national economic goals; and (10) correcting current frequency imbalances to reward efficient usage. This holistic approach ensures that consumers and the broader economy benefit from the new applications arising from market restructuring.

These principles translate into the following measures:

- **Consistent with Cabinet Decision and draft national policy, licensing frameworks remain technology-neutral where feasible, allowing FWA, FTTH, satellite, and other access technologies to compete on performance, coverage, and affordability. However, FWA-centric** outcomes are prioritized in this spectrum refarming context
- **Continuity of service** and consumer protection during migration.
- **Transparent auctions** and **hybrid pricing** (AIP + market auctions).
- **Milestone-based obligations** with LGs (Letters of Guarantees), audits, incentives, and sanctions.
- **Spectrum ceilings (**S_{max}**)** to prevent hoarding; S_{min} to ensure viability
- **Timeline:** Consultation period proposed at **3 weeks**; workshops and targeted stakeholder meetings during the consultation window; final policy and auction rules to follow.

7 Refarming Options

Based on the market sizing and financial assumptions summarized in Section 3.2(household count 1.26M; addressable FWA households 700k–900k; minimum viable scale 80k–120k subscribers; ARPU $15–25), the TRA's assessment indicates the market cannot viably sustain more than five wireless broadband operators within any region. The consultation retains multiple policy options (Options 1–3) to solicit stakeholder views; stakeholders are invited to submit alternative models and evidence.

Baseline Operators (common to all options):

- **MIC1** — National Mobile and FWA.
- **MIC2** — National Mobile and FWA.
- **MoT/Ogero at present, transitioning to Liban Telecom (LT)** — National POTS, Mobile, FWA, core infrastructure and international gateway.

Contingency provision*:* In the event that the corporatization of Liban Telecom is not completed within the Phase 3 timeline, MoT/Ogero shall continue to operate under its existing mandate or as otherwise mandated by the COM with spectrum assignments held in trust by the TRA, pending final corporate resolution. This shall not delay the refarming process for MIC1, MIC2, or FWA licensees.

These baseline operators are sometimes referred to, interchangeably, as MNO1 (MoT/Ogero transitioning to LT), MNO2 (MIC1) & MNO3 (MIC2) in this document.

The TRA proposes three policy pathways (Options 1, 2, 3 with variants) in addition to three **baseline national operators** and differing approaches to FWA rollout:

- **Option 1:** Baseline 3 operators + **1 national FWA** (4G/5G) + **1 regional FWA (with 4G FWA constraint due to a spectrum cap of 50 MHz)**— balanced national/regional mix; fosters localized competition.
- **Option 2:** Baseline 3 operators + **2 national FWA (4G/5G)** — stronger national competition; higher investment scale (Spectrum cap 80 – 100 MHz).
- **Option 3A:** Baseline 3 operators + **9 DSPs** elevated to national FWA with **30 MHz** each (constrained to **4G FWA**).
- **Option 3B:** Baseline 3 operators + **9 DSPs** elevated to national FWA with **40 MHz** each (constrained to **4G FWA**). Under this option, other midbands such as 1.5 and 2.1 GHz could be added to make up for required spectrum allocation (of 9 x 40 MHz)
- **Option 3C:** Baseline 3 operators + **a certain number of national FWA (4G/5G, depending on acquired spectrum) DSPs.** The number of DSPs as well as their spectrum will be determined based on the results of the auction of available spectrum (Spectrum cap 60 – 80 MHz).

Clarification on Option 3C: Option 3C is a **market-based variant** and is procedurally distinct from Options 3A/3B. While 3A/3B describe administrative, equal allocations, 3C uses competitive bidding to determine the number of winners and spectrum per winner. Thus, Option 3C will have its own auction parameters (reserve, lot sizes, Smin/Smax, eligibility rules.)

The following table summarized the three options and shows their key implications.

Option	Additional Access Licensees	Key Implications
Option 1	**+ 1 New National** **+ 1 New Regional**	**Balanced mix of national & regional players; fosters localized competition**
Option 2	**+ 2 New National**	**Stronger national competition; higher investment requirements**
Option 3	**+ 9 DSPs with extended status but with new T&C (License duration, spectrum allocation, price, & revenues …..)**	**Broad DSP participation; innovation potential; complex coordination**

Eligibility: Any existing DSP, consortium of DSPs, or new entrant may bid for national/regional licenses under Options 1 and 2 and 3C. Under Options 3A and 3B, existing DSPs receive equitable spectrum allocations administratively (with AIP pricing).

Backbone Buildout. TRA is considering to allow and encourage baseline operators and national DSPs to deploy and maintain their own national backbone (core) networks to support their national node interconnection and to provide wholesale interconnection services to regional and broadband access providers. These backbone networks must meet interoperability and non-discrimination requirements, comply with applicable technical and security standards, and be subject to TRA oversight to ensure fair access, transparent pricing, and continuity of service.

8 Spectrum Refarming Rules & Band Allocations

8.1 Spectrum Refarming Rules

- Optimal and efficient use of Spectrum in accordance to international best practices is the main target to be achieved from spectrum refarming
- Midbands (2.6/3.3, 3.5 GHz) to be refarmed, re-allocated and re-assigned for 4G/5G mobile licenses (Coverage & Capacity)
- The 2.3, 3.3/2.6 and 3.7-3.8 MHz bands to be re-allocated and re-assigned for:
  - ✓ FWA licenses (national/regional)
  - ✓ Private FWA
  - ✓ Parts to be reserved for future use
- Governmental entities will be assigned spectrum in low and midbands to address their needs
- Blocks of the 26 GHz band to be allocated for Regional/Local FWA and backhauling
- Spectrum used or awarded to be priced using Administrative Incentive Pricing (AIP) / Market mechanism (Auction)
- For Option 3, Licenses in Greater Beirut Area (region) can be awarded on the 26 GHz Band
- For Option 3, spectrum to be awarded either equally to the 9 DSPs or by auction and priced on the basis of Administrative pricing/Auction accordingly
- Minimum spectrum (S_{min}) to be secured for DSPs, will be awarded and priced either on the basis of Reserved Price or on the average of total open auctions of the remaining spectrum
- Spectrum ceilings (S_{max}) will be considered to prevent spectrum blocking and to ensure fair competition.
- DSPs could continue to use parts of the spectrum on a temporary basis but will have to pay RTU fees and Spectrum Administrative Charges (SAC) in line with the prices generated from (Reserved Price/Auction)
- In addition, current DSPs have to migrate from their current positions (i.e, band occupancy) unless they acquire same spectrum sub-bands in the refarming auction.

8.2 Band Allocations

Notation

- FDD /TDD indicated where relevant.
- **DSPs** are referenced only by acronym (DSP-1 … DSP-9).
- **Reserved** indicates blocks held for future awards or national expansion (e.g., 5G/6G).
- **Technology constraint:** DSPs may be constrained to **4G FWA** in cases where the assigned spectrum is not sufficient for 5G. Nonetheless, this constraint is lifted if they win sufficient spectrum for national licenses in Options 1 or 2 or 3C.

8.2.1 Spectrum allocated for 5G to Baseline Operators MNO1, MNO2 & MNO3

- ✓ Low Band:
  - 700 MHz Band:
    - Phase One: MNO1 2x10 MHz and release 2x10 MHz; SFs 2x(2x10) MHz and release 2x5 MHz;
    - Phase Two: Reserved 2x15 MHz
  - 800 MHz Band: MNO2 2x15 MHz & MNO3 2x15 MHz for 4G/5G;
  - 900 MHz Band: MNO2 & MNO3
    - Phase One: 2x15 MHz/Operator for 2G/3G; and 2x2.5 MHz to be released by each operator
    - Phase Two: 2x10 MHz/Operator; 2x5 MHz to be released by each operator
    - Phase Three: The whole band will be released (2x10 MHz to be released by each operator)
- ✓ Mid Bands:
  - 1500 MHz Band: 1427 – 1527 MHz. This band is allocated for Governmental services and Mobile Satellite Services (MSS). A portion of the band is already assigned to governmental services using TDD-based technologies (eLTE). The potential assignment of additional portions of this band for IMT use remains under study, with TDD identified as a possible deployment option.

- 1800 MHz Band: 1710 – 1880 MHz, 2x75 MHz FDD: (MNO2 2x35 MHz; MNO3 2x35 MHz)
- 2100 MHz Band: 1880 – 2170 MHz; TDD: 40 MHz + 15 MHz; FDD: 2x60 MHz (MNO2 2x15 MHz; MNO3 2x15 MHz)
    - Phase Two: 2x10 MHz/Operator; 2x5 MHz to be released by each operator
- The TRA will not pre commit to full reallocation of 1800 MHz and 2100 MHz. Instead, it invites evidence on partial or time phased refarming of sub blocks to augment FWA capacity while protecting incumbent mobile continuity. Any proposal must include technical coexistence studies, phased release sequencing, guard band proposals, migration timelines for MNOs, device/ecosystem readiness evidence, and commercial transition measures (compensation or support where justified). The TRA will only consider releases that demonstrate negligible risk to mobile service continuity and clear mitigation measures.
- 3.5 GHz Band (3300 – 3700) MHz and 2.6 GHz Band (2500 – 2700) MHz: 400-600 MHz to be allocated for Baseline national licensees; 3x(80-100) MHz + 3x(30-100) MHz reserved;
    - MNO2 & MNO3:
        - Phase one: (3.4-3.6) GHz Band: (80-100) MHz/Operator; Reserved (3.3-3.4)/(3.6-3.7): (30-100) MHz/Operator;
        - Final Phase: for 5G/6G (130-200) MHz/Operator
    - MNO1
        - Phase one: (2.5-2.7) GHz: (40 – 50) MHz to be assigned to MNO1; (40 – 50) MHz to be assigned for MNO1 upon establishment of Liban-Telecom; Reserved for 5G/6G (30-100) MHz
        - Final Phase: for 5G/6G (130-200) MHz

✓ High Bands (26 GHz, 1200 MHz bandwidth):

- 600 MHz to be allocated for baseline licensees,
    - 200 MHz for each operator
    - Sub-band of 200 MHz to be reserved for each operator
- **26 GHz local/regional licensing:** Given 26 GHz propagation limits and urban use cases, the TRA will include **local/regional licensing** as an explicit option alongside

national assignments. The consultation will request evidence on preferred block sizes, coordination zones, interference management, licensing duration and likely urban/enterprise demand. The TRA will offer both tracks (national and local) and propose coordination rules to avoid cross-jurisdiction interference.

8.2.2 Spectrum allocated for FWA (DSPs/New entrants)

- ✓ Midbands
  - 2100 MHz; TDD, 40 MHz + 15 MHz
  - 2.3-2.4 GHz; TDD, 100 MHz;
  - 2.6-2.7 GHz; TDD (0 – 70) MHz depending on spectrum to be allocated to MNO1 (130 – 200) MHz
  - 3.3-3.4 GHz; TDD (0 – 90) MHz depending on spectrum to be allocated to MNO2&3 (130 – 200) MHz
  - 3.7-3.8 GHz; TDD, 100 MHz;
- ✓ 1-2 National License with
  - Low Bands: 10 MHz in 700/900 MHz bands
  - Midbands: (60 – 80) MHz in (2.3 – 2.4) MHz & (3.7 – 3.8) GHz;
    - S_{min} = (20 – 30) MHz (Reserved Price) + (4 – 6)x10 MHz (Auction)
    - S_{max} = (80 – 100) MHz
  - 200 MHz (26 GHz) (Reserved Price/Auction)
- ✓ 1 Regional License
  - Midbands: 6-8 Regional Licenses (30 – 60) MHz/License;
    - S_{min} = (10–20) MHz (S_{min} (Reserved price)) + (3 – 5)x10 MHz Auction
    - S_{max} = (50 – 60) MHz
  - High Band (26 GHz): 600 MHz, 3 Blocks x 200 MHz
- ✓ 9 DSP Licenses
  - Midbands:

- Scenario #1: (30 – 40) MHz/License; Spectrum to be distributed equally and RTU Fees on the AIP basis
- Scenario #2: Spectrum to be awarded by auction; S_{min} = 10 MHz to be guaranteed for current DSPs upon winning additional blocks in the Auction

- High Band (26 GHz): 600 MHz, 3 Blocks x 200 MHz

8.2.3 DSP request for 80 MHz and extended C-band access

The TRA acknowledges the unified DSP request for **80 MHz per DSP** and for access to the extended C-band (3.8–4.2 GHz). The TRA notes that the upper portion of the extended C-band (3.8–4.2 GHz) is not currently assigned for FWA and will remain a conditional future option subject to device-ecosystem readiness, coexistence studies (including satellite FSS protection), and regional harmonization. DSPs can still obtain the 80 MHz as follows: **(a)** under **Option 1** and **Option 2**, 80 MHz may be considered for a DSP only where the number of awarded national DSP licensees is limited to **two or fewer**, thereby protecting national coverage and competition; **(b)** under **Option 3C**, a DSP may obtain national license status and the associated spectrum if it secures sufficient contiguous spectrum in the auction to meet the 80 MHz threshold; and **(c)** the TRA will apply the same auction, S_{min}/S_{max} and spectrum-cap rules to all bidders to preserve non-discriminatory treatment. Respondents seeking 80 MHz or extended C-band access should submit technical and commercial evidence (spectrum use cases, rollout plans, device availability, and financing) demonstrating how their proposal would preserve service continuity, competition, and national coverage objectives.

The 3.8–4.2 GHz band is treated as a conditional future option. Adoption requires (1) demonstrable device ecosystem readiness; (2) TRA commissioned coexistence studies with satellite FSS and incumbent services; and (3) regional harmonization evidence. Stakeholders may submit technical and commercial evidence; the TRA will commission a coexistence study and publish results. The TRA will set a decision milestone to confirm whether the band will be opened, and if opened, the initial award terms, operational conditions, and duration will be specified at that time.

Annex C is devoted for different spectrum band benchmarks and contains relevant questions that DSPs may be interested in responding to them.

8.3 Spectrum Auction

- ✓ For National License: open auction for blocks of (2x10 – 6x10) MHz in midbands to Current DSPs and new entrants
- ✓ Set reserved price for national and regional blocks on the basis of population
- ✓ New entrants can participate in the National/Regional auction
- ✓ Current DSPs can participate in the National/Regional auction either as individuals or as a consortium.
- ✓ Individual or Consortium bidders must demonstrate financial capacity equivalent to 3 years of projected CAPEX.

    - Current DSP should win in the auction the minimum defined below in order to be awarded S_{min}
        - National license minimum number of blocks (3 – 4 Blocks)
        - Regional license (1 – 2 Blocks)
    - A winner among current DSPs (Individual/Consortium) will be assigned spectrum
        - National: S_{min} = (20 – 30) MHz + (4 – 6) x10 MHz Awarded by auction.
        - Regional: S_{min} = (10 – 20) MHz + (1 – 3) x10 MHz Awarded by auction
    - Current DSP who loses in the auction will not be awarded a new license and his customers will be transferred to the relevant winner
    - To preserve consumer continuity for DSPs that do not secure spectrum in the auction, the TRA will define a wholesale continuity pathway. This pathway will be framed as a Virtual Network Operator (VNO) / Branded Reseller with Wholesale Access Rights. The VNO model will specify minimum wholesale access terms, SLAs, and commercial protections (non discriminatory reference offers) to enable displaced DSPs to continue serving customers under a wholesale arrangement while preserving incentives for infrastructure investment by license winners.
    - If number of auction candidates is less than or equal to number of licenses requested then the blocks allocated for auction can be awarded with reserved prices

- Spectrum that can be awarded to or collected by any licensee should not exceed S_{max}

Auction rules and spectrum caps are designed to prevent market abuse and ensure proportionate regulation, consistent with national policy pillars on competition and economic regulation.

8.4 Spectrum Fees

- Spectrum for P2P to be re-assessed, refarmed and priced on link-by-link basis
- MNOs and DSPs shall pay RTU Fees and Spectrum Administrative Charges for frequencies used in all IMT bands (AIP/Market based). Temporary spectrum uses by DSPs for PMP subject to RTU fees linked to auction/reserved prices and Spectrum Administrative charges.
- **Hybrid approach:** Administrative Incentive Pricing (AIP) for reserved allocations; market auctions for open blocks.
  - ✓ Current DSPs who win in the auction will pay:
    - S_{min} fees (reserved Price) + Blocks awarded by auction (Auction price)

Refer to Annex A for overall spectrum fees and pricing methodology.

9 Major License Terms and Conditions

Element	Baseline Operator	National DSP	Regional DSP
License Type	Individual	Individual	Individual
License Term	20 years	15 years	10 years
DSP Consortium	N/A	Encouraged	Neutral
FWA Technology	4G/5G	4G/5G[3]	4G
Mobility	Yes	No	No
Fixed Access (FTTH) in addition to FWA	Yes for LT only	Yes w/ Incentives	Yes w/ incentives
Protection period for Fixed Access (Fiber and wireless) after which Open Access is mandated	No	5 years	3 years
Backbone Obligation	Yes	Yes	No, just IX POP
Coverage and Reseller Customer Absorption Obligation (detailed in next section)	Yes	Yes	Yes

Financial obligations under new licenses, including any revenue-sharing or alternative fee structures, will be defined in the final licensing framework following consultation

[3] 5G is not permissible under Options 3A and 3B.

10 Coverage and Rollout Obligations

In line with national policy, rollout obligations are not limited to geographic coverage but also encompass affordability and digital inclusion, ensuring vulnerable and low-income households are served under enforceable universal service conditions. The 2 types of conditions below are meant to ascertain this objective:

1. Coverage and rollout conditions
2. Reseller customers absorption rollout conditions

10.1Coverage and rollout conditions

Benchmarks (staged): European and MENA benchmarks inform targets: Year 3 urban focus (50–65% population), Year 5 (75–85%), long-term low-band obligations ~90–95%.

The following are sample coverage and absorptions examples. Final obligations will depend on the consultation outcome and the Option(s) adopted by the TRA.

Aggregate (Nation-wide) Coverage Targets by Option

Unless explicitly specified, the % coverage figures in the table below represent national coverage percentages applied to overall population.

Option	Year 1	Year 2	Year 3	Urban Year 3	Year 5
Option 1 (3 baselines + 2 Nat. DSPs, **410 MHz**)	15%	35%	50%	65%	75%
Option 2 (3 baselines + 1 Nat. DSP + 1 per Region, **370 MHz**)	15%	35%	50%	65%	75%
Option 3A (3 baselines + 9 Nat. DSPs, **480 MHz**)	20%	45%	65%	60%	90%

Option	Year 1	Year 2	Year 3	Urban Year 3	Year 5
Option 3B (3 baselines + 9 Nat. DSPs, **570 MHz**)	20%	45%	65%	60%	90%

Option 3B Coverage – Spectrum Based, Year 3

Licensee	MHz	Year 3 % National	Sites
MIC1	80	8.81%	140
MIC2	80	8.81%	140
LT	50	5.51%	87
Each DSP (×9)	40	4.41%	70
All DSPs (9)	360	41.86%	661
Total	**570**	**65%**	**1,028**

- **Year-3 Coverage Percentage** = (licensee MHz / total Option MHz) × aggregate Year-3 target.
- **National Population: 6 Million; Per Site: Urban: 5000; Rural:1000**
- **PeoplePerSite$_{\text{weighted}}$** $= 0.70 \times 5{,}000 + 0.30 \times 1{,}000 = \mathbf{3{,}800}$.
- **Licensee Target Population**

$$\text{TargetPop}_i = \text{Year-3 \%}_i \times \text{NationalPopulation}.$$

i: Operator

- **Required Sites (rounded up)**

$$\text{Sites}_i = \left\lceil \frac{\text{TargetPop}_i}{\text{PeoplePerSite}_{\text{weighted}}} \right\rceil.$$

- **Per-site usable capacity**

$$\text{Site Capacity} = B \times \eta \times S \times A,$$

where B is the bandwidth per site used in the radio scenario (MHz), η is spectral efficiency, S is sectors per site, and A is availability.

10.2 Reseller Absorption and Customer Migration

Problem: Approximately **3,000 unlicensed resellers** serve many households outside lawful connections.

Objective: Regularize service provision, protect consumers, and migrate reseller customers into licensed services.

Absorption allocation (proposed):

- **Baseline operators (MNO1, MNO2, MNO3):** absorb **45%** of reseller customers (15% each).
- **DSPs (9 licensees):** absorb **55%** collectively (≈6.11% per DSP ≈ 50,000 customers each).

Allocation of Reseller Customer Absorption Obligations – Suburban & Rural by each Operator

Milestone	**Baseline Operators (MIC1, MIC2, MoT/Ogero transitioning to LT)**	**DSPs (9 licensees)**
12 months	Absorb ≥40% of assigned 15% quota	Absorb ≥25% of ~6.11% quota
24 months	Expand to rural/underserved clusters; absorb ≥75% of assigned 15% quota	Absorb ≥60% of 6.11% quota
36 months	Complete absorption of full 15% quota	Complete absorption of full ~6.11% quota (~50k customers each)
Core obligation	Maintain backbone; provide interconnection POPs for Regional Access DSPs	Ensure equitable migration; interconnect with national operators

Service continuity: Absorbing licensees must maintain backbone, interconnection, and SLA parity for migrated customers.; TRA monitors SLA compliance.

10.3 Enhanced Rollout and Service Quality Obligations

Licensees are subject to enforceable rollout milestones tied to the following performance KPIs:

- **Geographic Clusters:** Deployment will be monitored across three clusters: Urban (Beirut/Mount Lebanon), Suburban, and Rural. National licensees must achieve 95% population coverage in Urban/Suburban clusters and at least 75% in Rural clusters within 5 years.
- **Performance Benchmarks:** Minimum service quality must meet a threshold of 30 Mbps for 90% of the time, with maximum user latency not exceeding 50ms to ensure a high-quality "fiber-like" experience.
- **Reseller Absorption Quotas:** As a condition of license, operators must absorb a designated quota of unlicensed reseller customers within their assigned geographic clusters to ensure their transition into the legal, regulated market.

10.4 FTTH–FWA Coordination Mechanism

To avoid duplicated investment, stranded assets and consumer confusion where FTTH rollout and FWA obligations overlap, the TRA is considering coordination mechanisms to avoid duplicated civil works and to protect consumers. Key elements:

- FTTH map and timelines published with the final refarming decision and updated quarterly;
- Pre-award coordination so bidders receive confirmed FTTH rollout before proposals and can propose complementary FWA plans;
- Contractual adjustment rules that allow license obligations for clusters with funded FTTH commitments to be deferred, reduced or reallocated while preserving reseller-absorption responsibilities; and
- incentives/remedies (time-limited fee relief or LG adjustments) for FWA operators that defer build in FTTH corridors in exchange for binding wholesale offers and defined handover SLAs. The TRA will publish operational rules and the initial FTTH rollout map at the final decision stage.

11 Phased Implementation Plan and Immediate Actions

11.1 Immediate regulatory actions (concurrent with consultation):

- Where legally permissible, the TRA may rely on Article 48 to extend existing DSP authorizations for a limited period to ensure orderly migration. Where Article 48 does not provide a legal basis, the TRA will issue a narrowly tailored Interim Authorization under its statutory powers to preserve legal and service continuity.
- Enforcement notice requiring DSPs to vacate specified midband positions (e.g., 3.5 GHz) per MoT Decision #1982/E&M (Aug 10, 2022).
- Finalize decrees on spectrum fees, rights of way, infrastructure sharing, and inspection/enforcement regulations.

11.2 Phases

- **Phase 1 (Q1 2026):** Market assessment and options (complete).
- **Phase 2 (Q1–Q2 2026):** Stakeholder consultation, policy finalization and issuance of final refarming implementation plan.
- **Phase 3 (Q3–Q4 2026):** Auction rules, eligibility, reserve prices, and auction execution.
- **Phase 4 (Q1–Q2 2027):** Transition & migration — DSP migration obligations, reseller absorption, cluster assignments, continuity measures.
- **Phase 5 (Q3–Q4 2027):** Enforcement & monitoring — deploy spectrum monitoring systems, audits, penalties, and efficiency incentives.

12 Migration Sequence and Service Continuity Protocols

The transition from interim DSP authorizations to long-term licenses will follow a strict sequential path:

1. **Phase A (Vacation):** Immediate vacation of the 3.5 GHz band as per MoT Decision #1982/E&M.
2. **Phase B (Relocation):** Existing DSPs who win spectrum in the auction will migrate to their new assigned blocks. Operators who do not secure a license will be granted a 6-month "Sunset Period" to facilitate customer transfers. TRA is considering principles for wholesale continuity

(non-discrimination, minimum SLAs, transparent reference offers). TRA will decide whether and how to convert any of these into binding obligations after consultation

3. **Phase C (Absorption Fallback):** In cases where a DSP fails to migrate or secure a license, MoT/Ogero (Liban Telecom once established) or other licensed operator will act as the "Provider of Last Resort" to absorb orphaned subscribers, ensuring zero service downtime for the end consumer.

Phased Migration timelines. The TRA will publish **phased migration timelines** with clear milestones for: notification, procurement, testing, cutover and final decommissioning. As an interim planning baseline, the TRA proposes the following tentative maximum durations (subject to study findings and stakeholder evidence):

- **Notification period:** 90 days from award or formal decision.
- **Procurement and installation window:** 6–12 months for equipment procurement and site works for typical P2P/PMP replacements; longer windows (up to 18 months) may be allowed for complex national rollouts.
- **Testing and cutover window:** 30–90 days per site or cluster, including parallel operation where feasible.
- **Final decommissioning:** within 30 days after successful cutover and verification.

The transition to the new regime will be governed by a strict enforcement and monitoring system. During Phase 4, the TRA will manage the transfer of customers from DSPs who do not secure a new license to the relevant auction winners, with MoT/Ogero (LT once established) serving as a fallback to guarantee service continuity. Alternatively, DSPs who do not secure a new license could continue serving their customers as resellers of other licensed DSPs as permitted by Law 431. In Phase 5 (Q3-Q4 2027), the TRA will deploy advanced monitoring tools to detect unlawful use and publish annual compliance reports. A progressive penalty framework—including fines and license revocation—will be applied to address spectrum hoarding, while operators achieving high spectral efficiency and broad coverage will be eligible for regulatory incentives.

Licensees must comply with the Consumer Affairs regulation established by the TRA, including transparent service conditions, effective complaint handling, and enforceable safeguards against abusive practices. Service continuity during migration is a binding obligation.

13 Enforcement, Monitoring and Incentives

TRA is considering a set of monitoring and enforcement tools. Stakeholders are invited to comment on TRA's practical capacity to monitor KPIs, the administrative burden of proposed metrics, and realistic penalty structures

Enforcement realism: TRA requests stakeholder input on: (a) the operational feasibility of proposed KPIs; (b) data sources and reporting frequency; (c) resource implications for TRA and licensees; and (d) alternative, lower-burden monitoring approaches. Please provide evidence on monitoring costs and suggested priority KPIs.

Reporting & audits

- **Semiannual rollout reports**: coverage polygons, throughput, latency, site counts, reseller absorption by cluster type.
- **Independent audits**: Year 2, Year 3, Year 5 to validate coverage and SLA metrics.

Financial guarantees & incentives

- **Letters of Guarantee (LGs):** phased LGs tied to Year 1–3 milestones; callable on missed obligations.
- **Incentives:** up to **20% fee reduction** for verified early delivery (formula to be published: e.g., min(20%, 0.5% × months ahead × surplus percentage points)).
- **Sanctions:** claw-back of incentives, LG drawdown, license suspension, spectrum reallocation for persistent non-compliance.

Efficiency incentives

- Rewards for high bits/Hz efficiency and broad coverage; encouragement of network sharing to reduce duplication.

The TRA will publish annual compliance reports and performance indicators for coverage, quality, affordability, and resilience, consistent with the national monitoring framework.

14 Forward-Looking Impact Assessment

TRA invites stakeholders to provide evidence and analysis on the following topics:

1. **Market configuration 1–2 years post-implementation:** Provide scenarios and evidence on likely market structure, number of viable operators, and competitive dynamics.
2. **Sustainability in the Lebanese context:** Assess financial viability, demand elasticity, and likely investment behavior under each option.
3. **Enforcement and monitoring realism:** Identify practical tools TRA can use, data sources, reporting burdens, and resource implications.
4. **Consumer impact:** Provide estimates of likely retail price, quality, and coverage outcomes under each option. Please submit empirical data, case studies, or modelling where available. TRA will publish a summary of submissions and use them to refine final policy choices.

15 Consultation Questions

The following questions are intended to guide stakeholder input. They do not represent final regulatory decisions. TRA will use responses to shape subsequent instruments. Stakeholders are invited to provide input on the following issues. Responses should be evidence-based.

15.1 Strategic Options

1. **Option preference:** Which option (1, 2, 3A, 3B, 3C) best balances competition, investment, and efficient spectrum use? Please explain with evidence.
2. Should DSPs be elevated to a national service provider administratively (Options 3A/3B) or through auction (Option 3C)?
3. What is your evidence-based view of how many national and regional FWA operators the Lebanese market can viably sustain over the next 5–10 years? Provide a recommended market structure (number of national operators including baseline operators; number of regional operators.) Indicate the market-share thresholds at which competition would be materially weakened and propose appropriate S_{max}/S_{min} values to prevent concentration.
4. What minimum wholesale protections are necessary to preserve consumer continuity and competition? Provide evidence on enforceability and likely commercial impacts.

15.2 Spectrum Allocation & Auction Design

3. What evidence exists on device ecosystem readiness for 3.8–4.2 GHz (band n77 support)?
4. What technical coexistence measures for 3.8–4.2 GHz (band n77 support) (guard bands, coordination with FSS) would be required?
5. DSPs currently operating P2P links outside the IMT bands will likely be mandated to migrate those links into assigned IMT bands as per the refarming awards. **If you are a DSP:** Would you prefer the migration of your P2P links outside IMT bands to be handled as part of the current refarming exercise or in a separate refarming program? Explain the sequencing, timelines, and support measures that would make the migration feasible without service disruption.
6. **Band packaging:** Are the proposed block sizes and band assignments appropriate for FWA deployment? Suggest alternative but viable packaging if needed.
7. **For options 3A and 3B,** suggest the distribution of band allocations among the different DSPs, e.g., lottery or suggest other ways?
8. Option 3C is presented as one possible market-based approach. TRA invites stakeholder views on auction design parameters (reserve prices, lot sizes, eligibility, spectrum caps) and on alternative allocation mechanisms.
9. ***S_{min}/S_{max}*:** Are the proposed S_{min} and the concept of S_{max} appropriate? Propose specific values per band if different with justification.
10. **Auction sequencing:** What's the recommended auction sequence — band-by-band or all bands together? If band-by-band, what sequence would maximize efficiency and competition?
11. Given that baseline national operators (MIC1, MIC2, and MoT/Ogero transitioning to Liban Telecom) are expected to be licensed for 5G spectrum blocks (e.g., 80–100 MHz midband) under Council of Ministers decisions, what regulatory safeguards, spectrum caps, or auction mechanisms should the TRA adopt to ensure DSPs and new entrants have fair access to 5G spectrum and competitive opportunities?

15.3 Technical & Operational Issues

7. What are the challenges of reallocating the radio spectrum for fixed LTE and 5G networks?
8. What are the minimum data transmission rate requirements for fixed LTE networks to ensure consumer satisfaction?
9. How can interference with existing services (legacy PMP, P2P, or security force allocations) be managed during the refarming transition?

10. What migration sequencing protocols should be adopted to minimize disruption?

11. Do you agree that the TRA should adopt the migration sequence phased timelines proposed in Section 11 (Notification 90 days; Procurement/Installation 6–12 months; Testing/Cutover 30–90 days; Decommissioning 30 days)? If not, propose alternative timelines and provide supporting evidence (supply-chain constraints, procurement lead times, installation complexity, financing needs).

15.4 Investment & Market Development

11. **Pricing:** Do you support the hybrid AIP/auction approach? Provide inputs on reserve price methodology.

12. How can regulations encourage investment while ensuring efficiency and preventing market abuse?

13. **For option 3A and 3B,** where DSPs are allocated equitable spectrum across different bands with AIP spectrum pricing, should the price reflect the band value or should it be the same for all band allocations?

14. What incentives (fee reductions, infrastructure sharing, rights-of-way) are most effective in stimulating large-scale FWA and FTTH deployment?

15. DSP Consortium Willingness: If you are a DSP, would you be willing to participate in a national consortium to jointly bid for spectrum and licenses? Under what governance arrangements, and regulatory safeguards would such participation be acceptable and beneficial from your perspective?

16. Do stakeholders agree with the proposed introduction of Right-to-Use spectrum fees and Administrative Charges for IMT and FWA spectrum and for P2P links?

17. What methodology should be used to determine the value of spectrum in different bands?

18. Are there other international practices the TRA should consider when designing the new fee regime?

15.5 Consumer Protection & Universal Service

19. Reseller absorption: Are the proposed absorption quotas (45% baseline / 55% DSPs) and milestones feasible? Provide alternative proposals and supporting data.
20. What safeguards are needed to ensure continuity of service for reseller customers during migration?
21. What economic and social benefits should be measured to assess the success of the refarming exercise (e.g., affordability, rural inclusion, SME connectivity)?
22. How should universal service obligations be defined for FWA operators?

15.6 Transition sequencing and technical migration proposal

23. What technical migration proposals do you recommend for DSPs vacating current spectrum positions (including proposed timelines, interference-mitigation measures, coordination procedures, and testing windows)? Please provide evidence, estimated costs, and suggested milestones to ensure orderly transition and service continuity.
24. What Transition Plan and timeline do you envision for Unlicensed Operators (resellers)?

15.7 Enforcement & Monitoring

25. Are the proposed LGs, audits, and incentives sufficient to ensure compliance? Suggest improvements.
26. What performance indicators (coverage, throughput, latency, affordability) should be published annually by the TRA?
27. How should efficiency incentives (bits/Hz, coverage density) be structured?
28. Which KPIs are essential and practicable for TRA to monitor given current resources? Propose realistic reporting frequencies and data sources.

16 Annex A. Proposed spectrum pricing

16.1 Policy Rationale

The Telecommunications Regulatory Authority (TRA) is considering the introduction of a revised framework for **Right-to-Use (RTU) spectrum fees and administrative charges** applicable to spectrum assigned including **International Mobile Telecommunications (IMT), Fixed Wireless Access (FWA), and Point-to-Point (P2P) microwave links**.

Historically, spectrum usage in these bands has been subject to a legacy framework that effectively allowed operators broad and relatively unconstrained access to assigned spectrum resources, often without a pricing structure that reflects the **economic value, scarcity, and opportunity cost** of spectrum. This approach was used in earlier phases of sector development where the mobile operators are state owned and Data Service Providers represent a small niche market, it does not reflect current market dynamics, technological evolution, or international regulatory best practices.

The proposed reform aims to transition from this legacy "open usage" model to a **structured spectrum management framework** based on the principles of:

- **Efficient use of spectrum**, recognizing spectrum as a scarce national resource;
- **Transparency and predictability** in spectrum fees and regulatory charges;
- **Fair and non-discriminatory treatment** among spectrum users;
- **Alignment with international regulatory practices**, particularly those adopted in comparable markets.

Under the proposed approach, the TRA intends to introduce:

1. **Right-to-Use (RTU) Spectrum Fees**: annual or periodic fees reflecting the value of spectrum assigned for IMT and FWA services, taking into account factors such as bandwidth, frequency band, geographic scope, and potential economic value.
2. **Administrative Spectrum Fees**: charges designed to recover the costs associated with spectrum management activities, including licensing, coordination, monitoring, and enforcement.
3. **Updated Fee Structures for Point-to-Point Links**: a revised pricing framework for microwave backhaul links that better reflects spectrum congestion, path length, channel bandwidth, and link density, while promoting efficient network planning.

This reform seeks to **encourage more efficient spectrum utilization, support fair competition, and ensure the long-term sustainability of spectrum management**, while maintaining regulatory certainty for existing operators and enabling future investment in advanced wireless technologies.

Many jurisdictions have moved toward **structured spectrum pricing mechanisms**, including annual spectrum usage fees or auction-based right-to-use charges.

Examples include:

Country	**Spectrum Pricing Approach**
United Kingdom (Ofcom)	Annual Administrative Incentive Pricing (AIP)
Saudi Arabia (CST)	Spectrum usage fees based on MHz and geographic area
European Union	Mix of auctions and annual usage fees
UAE	Spectrum fees based on bandwidth and coverage

The proposed fees review will apply to the following spectrum uses:

IMT Spectrum

- Including spectrum bands used for 2G, 3G, 4G LTE and 5G.
- Typical bands include 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600, and 3.5 GHz

Fixed Wireless Access (FWA)

Spectrum assigned for **fixed wireless broadband services**, including:

- licensed FWA bands
- mid-band spectrum used for broadband connectivity

Point-to-Point Microwave Links

Spectrum used for **backhaul networks**, including:

- microwave transmission links
- high-capacity backhaul networks supporting mobile and fixed infrastructure.

16.2 International Benchmark – Annual Spectrum Fees

IMT Spectrum Fee Benchmarks

Country	Pricing Model	Example Fee Basis
UK	Administrative Incentive Pricing	£/MHz per region
Saudi Arabia	MHz × Population × Band factor	Annual fee
UAE	Bandwidth-based	Confidential but structured
France	% of spectrum value	Annual usage fee
Spain	MHz × Population	Annual
Morocco	MHz-based	Annual license fee
Jordan	Spectrum usage fee	MHz based

Example Annual Fees for Mobile Spectrum

Country	Approx Annual Fee for 20 MHz National License
UK	€1M – €4M
Saudi Arabia	€2M – €5M
Spain	€1M – €3M
Morocco	€0.5M – €1.5M
Jordan	€0.3M – €1M

16.3 Fees structure

- **Spectrum fees vary** depending on frequency band, market size and spectrum scarcity.
- **FWA spectrum fees** are usually priced lower than mobile IMT.
- For **Point-to-Point Microwave** fees, regulators typically charge **per link based on bandwidth and band**.
- **For Administrative Spectrum** fees, separate **cost-recovery administrative charges apply.**

The TRA will present its proposal through a decree, as required by Law 431/2002, and will submit the draft decree to public consultation, while ensuring that existing licensees are given appropriate time to adapt to the new fee structure.

17 Annex B — Draft Legal, Regulatory and other Instruments

17.1 Draft TRA Decision — Temporary extension of DSP licenses

Legal Note on Temporary Measures: Where legally permissible, the TRA may rely on Article 48 to extend existing DSP authorizations for a limited period to ensure orderly migration. Where Article 48 does not provide a legal basis, the TRA will issue a narrowly-tailored Interim Authorization under its statutory powers to preserve legal and service continuity.

17.2 Draft Decree — Spectrum Fees (outline)

- **Components:** Reserved price schedule, AIP parameters, RTU fee table, LG calculation method, fee reduction incentive formula (up to 20%).
- **Implementation:** Fees payable upon license award; RTU fees payable monthly for temporary use.

17.3 Draft Decree — Rights of Way & Infrastructure Sharing

- **Obligations:** Licensees must provide non-discriminatory access to passive infrastructure; RoW fees standardized; timelines for approvals.
- **Incentives:** Reduced fees for verified infrastructure sharing agreements.

17.4 Draft Regulation — Inspection & Enforcement

- **Powers:** TRA inspection authority, audit protocols, LG drawdown procedures, progressive sanctions (fines → suspension → revocation).
- **Transparency:** Annual compliance reports published.

17.5 Human EMF Exposure Limit and Radio Site Regulations

All licensees shall comply with Human EMF Exposure Limit and Radio Site Regulation once duly issued.

17.6Dispute Resolution

Spectrum-related disputes between licensees shall be resolved through the Dispute Resolution regulation.

17.7Upper C-Band Study

The TRA will commission a study of the upper C-Band (3.8–4.2 GHz) and publish results. The TRA will set a decision milestone to confirm whether the band will be opened, and if opened, the initial award terms, operational conditions, and duration will be specified at that time.

18 Annex C — Different Band Benchmarks & Questions

18.1 2.3 GHz (2300–2400 MHz)

International benchmarks show that the 2.3 GHz band is widely identified for IMT, mainly using TDD technologies such as LTE-TDD and 5G NR (band n40). The band has been extensively deployed in the Asia–Pacific region and in several countries in the Middle East and parts of Africa for mobile broadband and fixed wireless access (FWA) services, benefiting from a relatively mature device ecosystem. In Europe, adoption has been more limited and often focused on localized or supplemental broadband deployments. Given these international developments, Lebanon may consider the 2.3 GHz band as a potential capacity band for IMT, subject to spectrum availability, coexistence with existing services, and regional harmonization trends. Stakeholders are invited to provide evidence on the feasibility and market demand for IMT use in this band.

18.1.1 (2.3 GHz Band) Consultation Questions

1. **Designation and licensing model:** Should 2300–2400 MHz be designated for IMT in Lebanon, and if so, what licensing model is preferred (national, regional, shared/local)?
2. **Block sizes and packaging:** What channel bandwidths and block sizes (e.g., 20/40/80 MHz) would best support LTE-TDD / 5G NR in this band?
3. **Device ecosystem evidence:** Provide evidence on terminal and equipment availability for band n40 and expected timeline for ecosystem maturity.

18.2 2.5 GHz (2500-2690 MHz)

International benchmarks show that the 2.5 GHz band is widely harmonized for IMT and represents one of the most established mobile broadband bands globally. The band has historically been deployed using an FDD arrangement, particularly in Europe and several other markets. However, many countries are increasingly adopting TDD configurations, especially for 5G deployments, as TDD enables larger contiguous channel bandwidths and better adaptation to asymmetric mobile data traffic. The band is widely used across Europe, the Middle East, and Asia-Pacific for mobile broadband capacity and fixed wireless access (FWA) services. Given its strong ecosystem and international adoption, Lebanon may consider the 2500–2690 MHz band as a key capacity band for IMT, subject to spectrum availability, treatment of existing assignments, and alignment with regional harmonization trends. Stakeholders are invited to provide evidence on the feasibility and timing for assigning this band for IMT services.

18.2.1 (2.5 GHz Band) Consultation Questions

1. **Designation and transition:** Should Lebanon designate all or part of 2.5 GHz for IMT, and if a move to TDD is proposed, what migration approach and timeline are required for existing assignments?
2. **Packaging and caps:** What block sizes and spectrum caps should be applied to ensure competition and efficient use?

18.3 3.5 GHz (3300–3800 MHz)

International benchmarks show that the 3.5 GHz band is the primary globally harmonized band for 5G IMT deployments. The band has been widely assigned across Europe, the Middle East, Asia-Pacific and other regions, typically using TDD technology, enabling large contiguous channel bandwidths suitable for high-capacity 5G services. Its favorable balance between coverage and capacity, together with a strong and mature device ecosystem, has made it the core spectrum

band for early 5G deployment worldwide. Lebanon may therefore consider the 3.3–3.8 GHz range as a key band for future 5G services, subject to spectrum availability, treatment of existing assignments, and alignment with regional and international harmonization frameworks. Stakeholders are invited to provide evidence on the feasibility, timing, and market demand for assigning this band for IMT services.

18.3.1 (3.5 GHz Band) Consultation Questions

1. **Designation and primary use:** Should 3.3–3.8 GHz be designated for IMT and, if so, should it support nationwide 5G, FWA, or a mix? (Respondents must justify preferred split.)
2. **Block size and caps:** What contiguous block sizes (e.g., 80–100 MHz) and aggregation limits are appropriate to support high-capacity 5G while preserving competition?
3. **Migration/coexistence evidence:** Provide technical evidence and proposed migration measures where existing services occupy parts of the band.

18.4 Extended C-Band (3.8–4.2 GHz)

International benchmarks show that while the 3.3–3.8 GHz range is widely harmonized for IMT, the upper C-Band (3.8–4.2 GHz) is only partially adopted. In Europe, it is primarily licensed for local/private 5G networks, while in the MENA region, Saudi Arabia has assigned 3.8–4.0 GHz nationally to mobile operators. Lebanon will therefore treat 3.8–4.2 GHz as a **future option**, subject to device ecosystem readiness, coexistence studies with satellite services, and regional harmonization outcomes. Stakeholders are invited to provide evidence on the feasibility, timing, and market demand for extending IMT awards into this band.

18.4.1 (Extended C-Band) Consultation Questions

1. **Conditional future option:** Should Lebanon consider extending IMT awards into 3.8–4.2 GHz in a later phase? Provide evidence on device support, coexistence with FSS, and timing.
2. **Preferred initial use:** If adopted, should the band be reserved for local/private networks or opened for national macro assignments? Provide rationale and rollout timelines.

18.5 5 GHz Band (5150–5925 MHz)

The 5 GHz band is widely used worldwide for Wi-Fi and other license-exempt wireless broadband technologies.

In the EU, countries generally allow license exempt use across 5150–5350 MHz and 5470–5725 MHz, subject to technical conditions such as DFS (Dynamic Frequency Selection) and power limits to protect radar systems.

In the Middle East, countries such as Saudi Arabia, the United Arab Emirates, and Qatar also permit use of parts of the band for Wi-Fi and wireless broadband applications, including outdoor deployments under defined technical rules.

Given its mature ecosystem and importance for broadband connectivity, Lebanon may consider maintaining and enabling light license with technical conditions of the 5 GHz band to ensure compliancy between services allocated on this band, while ensuring coexistence with incumbent services and alignment with international regulatory practices.

18.5.1 (5 GHz Band) Consultation Questions

1. **Light License framework:** Should Lebanon maintain Light license use across the 5 GHz sub-bands, and which sub-bands (if any) should allow wider outdoor/higher-power use?
2. **Technical conditions:** What specific technical conditions (DFS, power limits) are required to protect incumbents while enabling outdoor broadband?

18.6 6 GHz Lower Band (5925–6425 MHz)

The 5925–6425 MHz band has been opened in a number of countries for license exempt use, mainly to support Wi-Fi 6E and Wi-Fi 7.

In the European Union, this range is authorized for low power indoor operation. In the Middle East, some administrations such as the United Arab Emirates and Saudi Arabia have enabled license exempt use of parts of the 6 GHz band, while others are still evaluating possible regulatory approaches.

Given the growing demand for high-capacity indoor connectivity, Lebanon may consider allowing license exempt use of the lower 6 GHz band for indoor and light license for outdoor use, subject to appropriate technical conditions and protection of incumbent services.

18.6.1 (6 GHz Band Lower Band) Consultation Questions

1. **Allow Wi-Fi 6E/7:** Should Lebanon allow license-exempt use of 5925–6425 MHz, and should operation be limited to low-power indoor or broader models? Provide technical safeguards.

18.7 6 GHz Upper Band (6425–7125 MHz)

The upper 6 GHz band is currently being examined in several regions for future broadband use. Some countries are considering the band for IMT/5G, while others are assessing extended license exempt use.

In the EU, studies are ongoing, and a number of Middle East administrations are also reviewing possible approaches.

Lebanon may therefore treat 6425–7125 MHz as a candidate band for future broadband services, taking into account international developments and coexistence with existing users.

18.7.1 (6 GHz Band Upper Band) Consultation Questions

Candidate band approach: Should Lebanon consider 6425–7125 MHz for IMT or license-exempt use? Provide evidence and preferred regulatory approach.

18.8 26 GHz Band (24.25–27.5 GHz)

The 26 GHz band is internationally identified as a key millimeter wave band for 5G.

In the European Union, the 24.25–27.5 GHz range has been harmonized for IMT and is being assigned by several administrations for early 5G high-capacity deployments, particularly in dense urban areas and for fixed wireless access.

Countries in the Middle East, including Saudi Arabia and the United Arab Emirates, have also made parts of the band available for 5G services. Given the large bandwidth available and its potential for very high data rates.

Lebanon may consider the 26 GHz band as a candidate for future 5G deployments, subject to spectrum availability and coexistence with existing services.

18.8.1 (26 GHz Band) Consultation Questions

1. **Designation and primary use:** Should Lebanon designate 24.25–27.5 GHz for IMT/5G, and should it prioritise dense urban FWA and hotspot deployments?
2. **Block sizes:** What block sizes (e.g., 200/400 MHz) are appropriate?
3. TRA is considering national licensing of the 26 GHz band. Stakeholders are invited to comment on appropriate block sizes, coordination zones, and demand evidence.

19 Annex D — International Spectrum Benchmarking

Purpose

This annex provides a comparative analysis of spectrum allocation practices across MENA and selected international markets. It serves as TRA's reference framework for the proposed refarming plan and addresses international benchmarks cited by stakeholders.

Spectrum Allocations per Operator — Regional Comparison

Country	Regulator	Operators	Avg MHz/Op	5G Band	FWA Model
Saudi Arabia	CST	3 MNOs	200-300	3.4-3.8 GHz	MNO + FWA
UAE	TDRA	2 MNOs	250-350	3.3-3.8 GHz	MNO-integrated
Jordan	TRC	3 MNOs	120-180	3.5 GHz	MNO-led
Egypt	NTRA	4 MNOs	100-150	3.5 GHz	MNO-led
Qatar	CRA	2 MNOs	200-250	3.4-3.6 GHz	MNO-integrated
France	ARCEP	4 MNOs	150-200	3.4-3.8 GHz	MNO-led
Germany	BNetzA	3 MNOs + local	150-200	3.4-3.8 GHz	MNO + private 5G
Lebanon (proposed)	**TRA**	**3 MNOs + FWA**	**130-200**	**3.3-3.8 GHz**	**MNO + FWA**

Key Findings

- Lebanon's proposed allocation of 130–200 MHz per baseline operator is consistent with regional peers (Jordan: 120–180 MHz; Egypt: 100–150 MHz) and appropriate for Lebanon's market size.
- The dedicated FWA licensing model (Options 1 and 2) is aligned with Saudi Arabia's approach of maintaining separate FWA operators alongside MNOs.
- Most MENA regulators are using the 3.3–3.8 GHz band as the primary 5G band, consistent with Lebanon's proposed approach.
- Technology-neutral licensing is now the norm globally, with the GSMA reporting that over 143 networks worldwide are planning 2G/3G shutdowns by 2030 to refarm spectrum for 4G/5G.
- Qatar's CRA mandated 3G shutdown by end of 2025, demonstrating regional momentum toward spectrum refarming.

2G/3G Shutdown Benchmarks

Country	2G Shutdown	3G Shutdown	Approach
Qatar	Planned	End 2025	Regulator-mandated
Singapore	2017	2021	Operator-led
Australia	Ongoing	2024-2025	Operator-led
USA	AT&T: 2022	Multiple	Operator-led
Lebanon (proposed)	**Phase 1: End 2026**	**Full: 2029**	**Regulator-led, phased**

END OF CONSULTATION DOCUMENT